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PENSOFT

Third Argentine record of *Eurhopalotrhix bruchi* (Santschi, 1922) (Hymenoptera, Formicidae), description of an interomorphic queen and the colony, and notes on biology and ecology

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Abstract

Eurhopalothrix bruchi is the only species of the genus present in Argentina. We present only the third record of this species from Argentina and describe for the first time the female and characteristics of the colony. The nest collected had 48 workers, 6 queens, and 4 pupae. The queens are characterized as wingless, without wing sclerites, and worker-like. The scarcity of pre-imaginal stages suggests that fission of the colony led to the nest's foundation.

Key words

Apterous females; dispersal strategies; biogeography.

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Introduction

The genus *Eurhopalothrix* Brown & Kempf, 1960 belongs to the subfamily Myrmicinae and was recently placed within the tribe Attini (Ward et al. 2014). The distribution of the 53 species includes Australasia, Indomalaya, Nearctic, Neotropical, and Oceania bioregions (Taylor 1980, Longino 2013, Bolton 2016, Antweb 2017). These ants mainly inhabit tropical and subtropical forests (Taylor 1980, Longino 2013), although *Eurhopalothrix bruchi* (Santschi, 1922) has recently been found in grasslands (Santondré et al. 2016). Little is known about the habits of species of this genus, and nests are rarely found. Sexed individuals are unknown for many species. Species of *Eurhopalothrix* are slow-moving, cryptobiotic, and small to very small (Brown and Kemps 1960). This genus inhabits rotten wood and leaf litter and are predators of small arthropods (Wilson 1956, Brown and Kempf 1960, Wilson and Brown 1985). The characteristic setae of this group may facilitate the adherence of organic matter to the body (Hölldobler and Wilson, 1986), providing camouflage.

Eurhopalothrix bruchi is the only species of the genus present in Argentina. It was recorded for the first time in Alta Gracia, Córdoba province (Santchi 1922), and was again recently recorded from the Sierra de la Ventana, Buenos Aires province (Santondré et al. 2016). These are the only records of this species outside of the tropical and subtropical

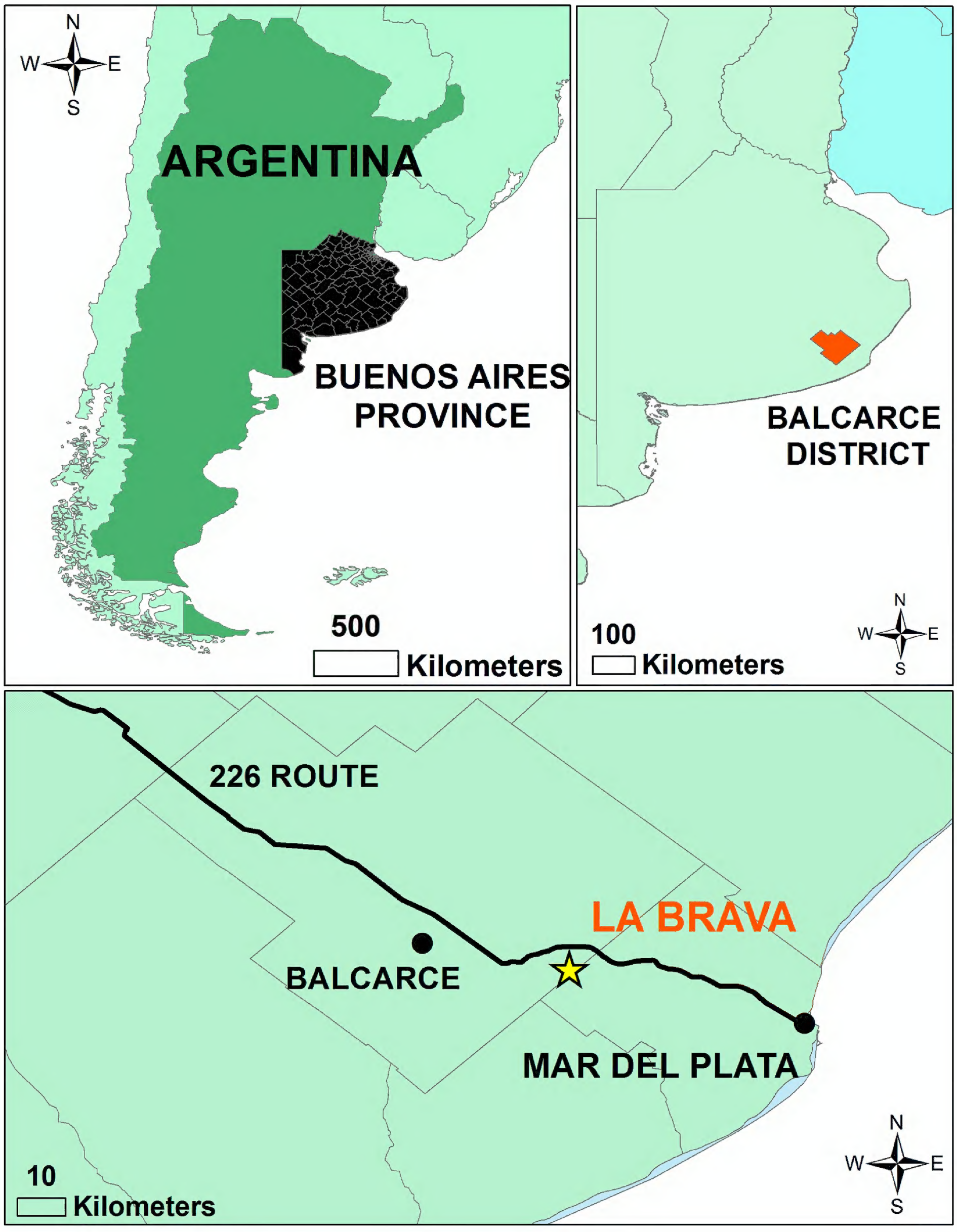

Figure 1. Geographic location of the Sierra La Brava within Buenos Aires province, Argenitna.

region and the only records for Argentina. Queens, males, and colony characteristics have never been described. We present the third record of this species for Argentina and the second one for Buenos Aires province. We describe for the first time the queen and the characteristics of the colony. We also interpret the morphological adaptations to the lifestyle of this species and comment on of its biogeography.

Methods

The Tandilia system, a mountain range with heights between 50 and 354 m above sea level, is aligned north–southeast in the province of Buenos Aires, Argentina, and extends for about 300 km. The system has an approximate area of 12,314 km^2 that includes scattered hills

separated by valleys and plains (Kacoliris et al. 2013). The climate of the Sierras Bonaerenses complex is temperate to cold and dry, according to some authors, and dry and subhumid, according to others (Morello et al. 2012). Winter snowfalls are sometimes recorded. The average annual rainfall is approximately 800 mm. The warm season (October–March) has the most precipitation, in the form of rain. The maximum average temperature is 20.5 °C in January and the minimum average is 7.5 °C in July.

The Sierra La Brava (37°52′52″ S, 057°58′38″W), belonging to the Tandilia system, is a typical landscape of the Pampean wetland (Fig. 1). It includes 2 mesetiform elevations and a small isolated hill that surrounds a lake basin (Mazzanti and Bonnant 2013). The Sierra La Brava is 29 km southeast of the city of Balcarce, Buenos Aires, Argentina. This area is a relic of the grassland communities native to the Peri-Serran plains, which currently are less than 5% of their original area due to extensive agricultural transformation (Bilenca and Miñarro 2004). Among the most abundant plant species are species of *Stipa* L. and *Piptochaetium* J.Presl, accompanied by *Paspalum quadrifarium* Lam. and *Cortaderia selloana* (Schult. & Schult.f.) Asch. & Graebn..

The colony we describe here was found in October 2013 under a rock at the foot of the Sierra La Brava. Individuals from the colony were preserved in 90% alcohol and deposited in the collection of the Lorenzo Scaglia Natural Science Museum (MMEP-HYM), Mar del Plata, Argentina. We identified our specimens using keys by Kusnezov (1956) and Bolton (1994). We also compared these specimens with the descriptions of *E. bruchi* (Brown and Kempf 1960, Longino 2013, Santondré 2016, Antweb 2017). We describe the queen using the standard measurements and indices (Brown and Kempf 1960) as follows: TL = sum of the axial lengths of the parts of the body, including head and closed mandibles, but not the extruded parts of the sting or genitalia; HL = axial length of head measured from full-face dorsal view, including all occipital lobes and clypeus, but excluding mandibles; HW = maximum width of head from full-face dorsal view; ML = distance to which normally closed mandibles project beyond most advanced point or points on clypeus, as seen in dorsal full-face view; scape L = length of scape from extremity of basal lobe or angle to apex; WL = Weber's length of alitrunk, a diagonal straight-line measurement from anterior face of pronotum to inferior propodeal angles, taken in side view; CI, or cephalic index = HW/HL × 100; MI, or mandibulo-cephalic index = ML/HL × 100. We took the data from 6 specimens and established ranges of measurements.

Using ArcGis (v. 10.1), we mapped the distribution of *E. bruchi* in South America, using records downloaded from the Antweb database (2017). Records not appearing in the database were georeferenced using Google Earth™.

Results

New record. Argentina, Buenos Aires Province, Balcarce District (37°52′52″ S, 057°58′38″ W), Juan Arcusa, 2013-08-13 (MMEP-HYM 8125, 48 workers, 6 queens, and 4 pupae).

Identification. The diasnostic characteristics of *Eurhopalotrhix bruchi* are: face including clypeus, dorsal mesosoma, first gastral tergite, and legs covered with abundant and homogeneous pilosity of apressed squamiform setae; posterior face of propodeum with broad lamella and without propodeal spine.

The colony, approximately 20 cm in diameter (Fig. 2), was located under a rock of approximately 20 cm in diameter. This was a polygynous colony composed of 48 workers, 6 queens, and 4 pupae. The ants of this colony were slow moving, even after disturbance.

The description of the queen is as follows: TL 1.9–2.7 mm, HL 0.53 mm, HW 0.6–0.65 mm (CI 122.6 mm), scape L 0.6 mm, WL 0.75–0.78 mm. Mandibles short (0.23 mm), protruding beyond clypeus ca 0.13 mm at full closure. Eyes conspicuous, with ca 50 ommatidia. Clypeus broad and flat, with a deep anterior median

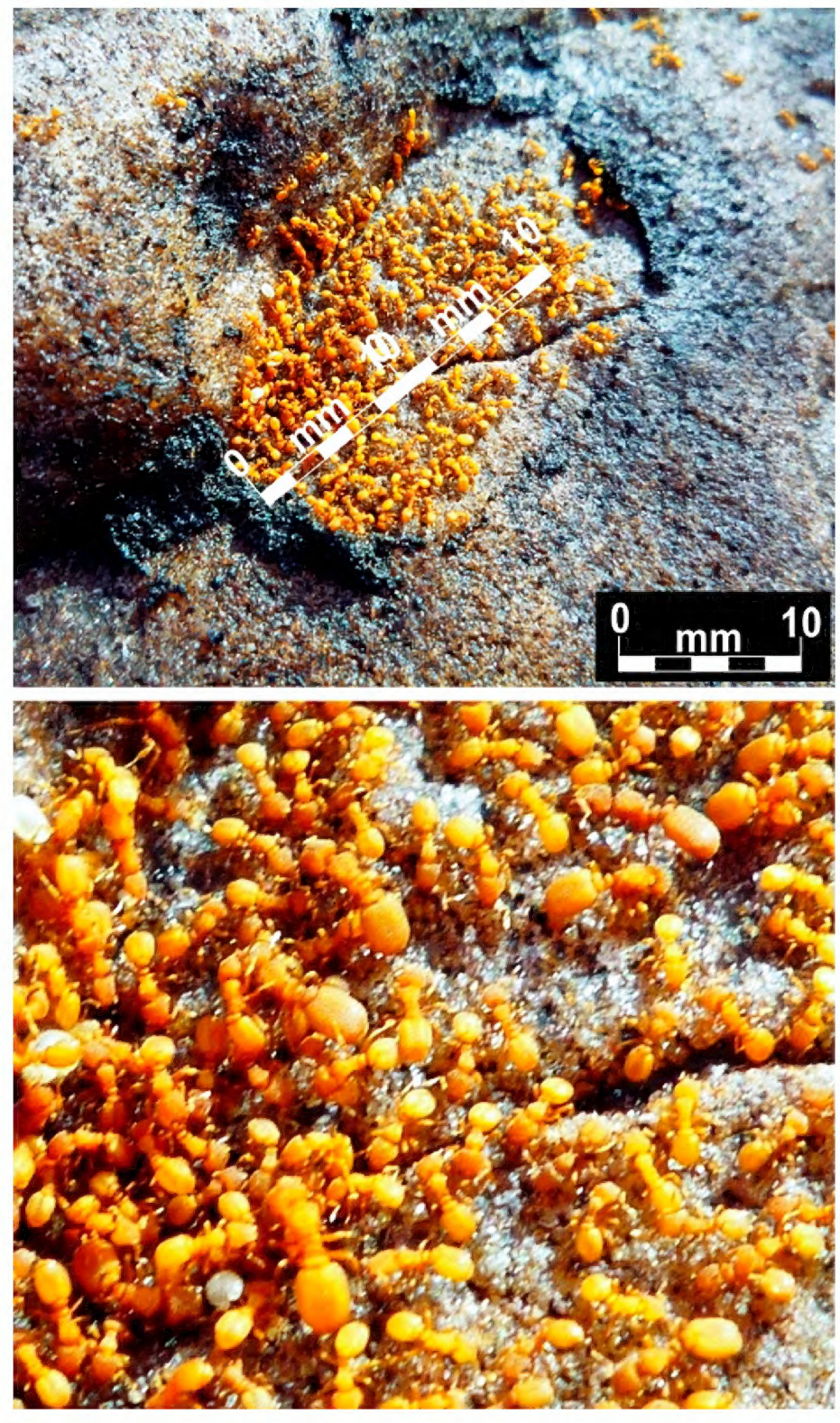

Figure 2. Polygenic colony of *Eurhopalothrix bruchi* found under a rock.

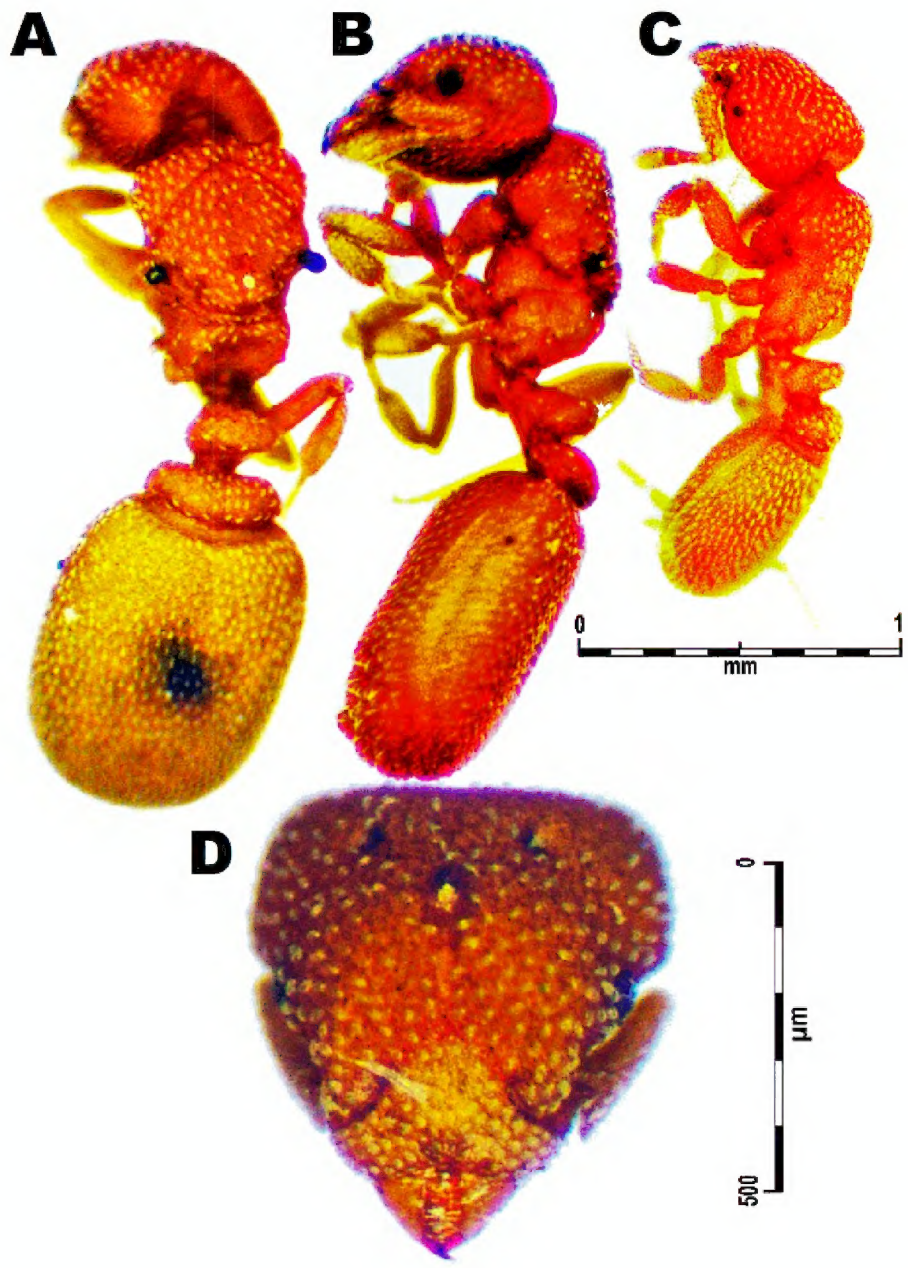

Figure 3. Photograph of a queen specimen of *Eurhopalothrix bruchi* compared with a worker. **A.** Interomorphic queen in dorsal view. **B.** Lateral view of the same. **C.** Worker in lateral view. **D.** Frontal view of the queen head.

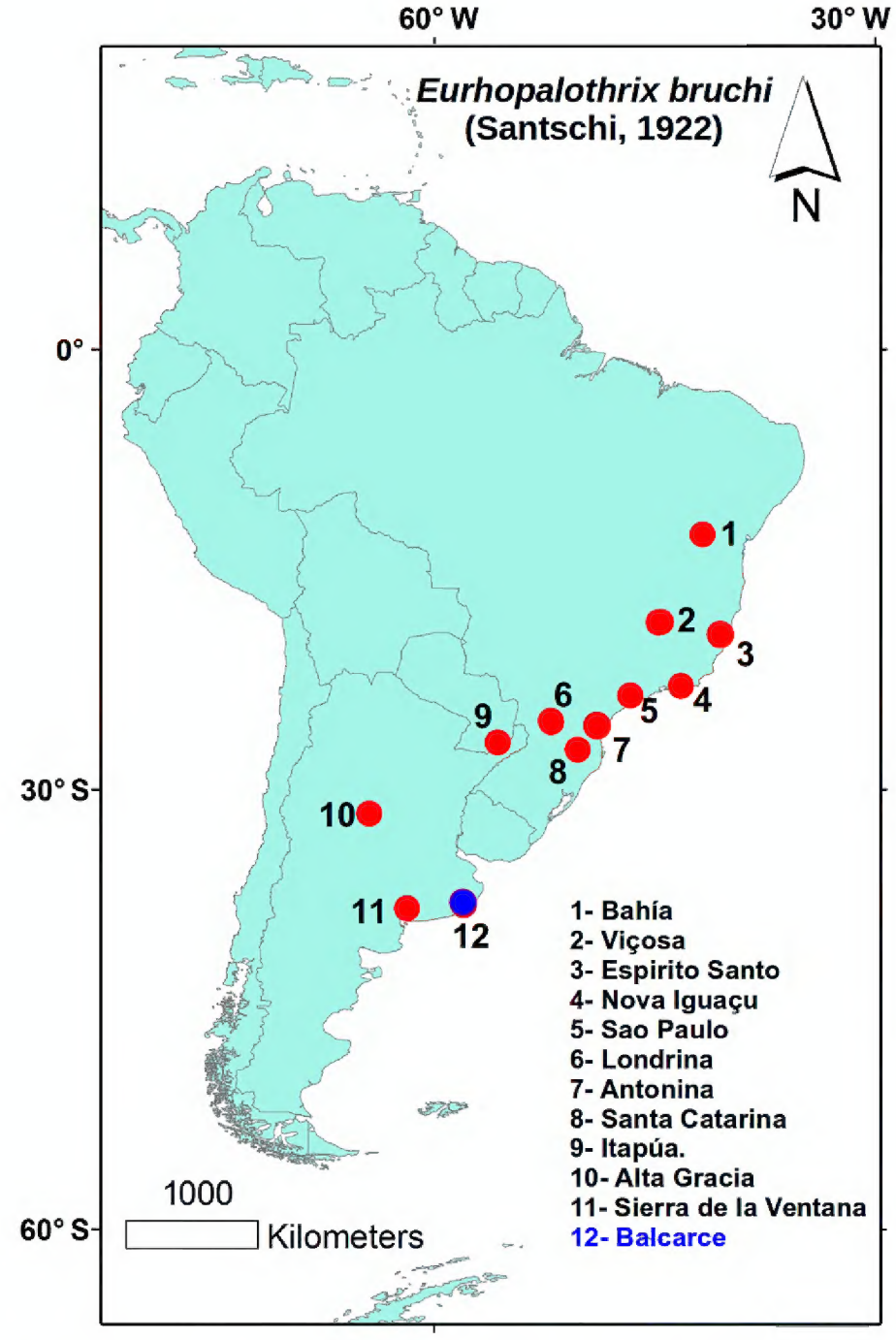

Figure 4. Map of known localities and whole geographic distribution for Eurhopalothrix bruchi. Blue circle: new record. Red circles: Antweb database.

emargination. Strong alitrunk, without wing sclerites; promesonotum almost flat, with moderately prominent but rounded humeri; metanotal groove distinct, and constriction of alitrunk at this point is also distinct as seen from above. Propodeum short, with a widened caudad, its dorsum curving evenly into the declivity; declivity concave from side to side and convexly marginate laterally, the blunt margins each have a fine cariniform margin below. No traces of propodeal teeth; propodeal outline, as seen from the side, evenly rounded. Petiolar node much compressed anteroposteriorly, subtruncate, but rounded above as seen from the side, transversely elliptical and nearly twice as long as broad when seen from above. Postpetiole also transversely elliptical, broader than petiolar node, and more than twice as wide as long. Gaster broader than the head, with parallel, only weakly convex sides, composed almost entirely of the first segment, which is boxlike and nearly flat above. Apical segments reduced and more or less ventrally displaced so that they are scarcely visible from dorsal view. Legs short and thick. Body densely and finely granulose-punctulate and opaque, except for smooth and shining mandibles. Dorsal surfaces of body, legs, scapes, and gula covered with numerous short, inverted spoon-shaped hairs, appressed and subappressed, which appear like small, spaced, semitransparent scales. No larger specialized hairs present on head, alitrunk, or elsewhere; thick spatulate hairs of tibial apices not markedly distinct from remainder of the squamiform hairs of the tibiae. Color ferruginous yellow (Fig. 3).

All known records for *E. bruchi* are from northeastern Brazil (Bahía state) to southeastern Argentina (Tornquist and Balcarce districts, Buenos Aires province). Our record is 350 km from the easternmost previously known record (Santondré et al. 2016) (Fig. 4).

Discussion

The morphology of *E. bruchi* is characteristic of predatory cryptobiotic species (Brown and Kempf 1960). They are small to medium-sized, possessing a thick, hard integument, an often flattened head, and broad, deeps crobes that receive most or all of the antennae. The scapes are dorsoventrally depressed, and in some species their basal angles form prominent anterior lobes. These ants also possess much-reduced maxillary and labial palps, a prominent and heavily sclerotized labrum, and solidly fused pronota and mesonota (Wilson and Brown 1984). In addition, *E. bruchi* has morphological characteristics of species with hypogean habits; species with this lifestyle are characterized by having smaller eyes and a small body with short appendages; they also present a corporal depigmentation (Tinaut and Lopez 2001). These charac-

teristics exist in other groups that show the same habits, including the coleopteran family Carabidae (Barr 1968, Christiansen and Christiansen 2005, Reboleira et al. 2010, Sket 2008). Moreover, species of *Eurhopalotrhix* have bodies covered by setae, which can be clavate, spatulate, globose, squamiform, or some other unusual shape (Wilson and Brown 1984). In *E. bruchi*, the setae are squamiform. This reinforces the hypothesis of a predominant hypogean lifestyle because this type of pilosity reduces friction and facilitates mobility underground (Holldobler and Wilson 1986).

Queens of *E. bruchi* were found to be wingless, without the wing sclerites, and worker-like. This condition implies that nuptial flight is absent. Brown and Wilson (1957) proposed that queens either are fertilized inside the nest or are fertilized outside but then return to it and remain within the colony. In this way, the polygynous colony is divided by fission when it reaches a critical density. Because we found no evidence of pre-imaginal stages, we suggest that this mechanism was responsible for the nest's recent founding. If a mature colony had been found, larvae and pupae should have been found in quantity.

Recently, photographs of 1 queen and 1 male of *E. bruchi* from Viçosa (Mina Gerais, Brazil) were published (Antweb 2017). The queen differs morphologically from those we found, mainly because the specimen has the altitrunk and wing sclerites developed. All the queens that we collected lacked these structures. However, the specimen shown on Antweb presents erect setae, whereas in our queens the setae are squamiform. This could that the queen on Antweb is not *E. bruchi* owing to its morphological differences; no workers and queens had been found together until now, and no description existed of the females of this species. Therefore, the female could have been erroneously associated with this species. Alternatively, the Antweb specimen corresponds to the gynomorphic form of the queen that one would expect to find in a tropical zone (Heinze and Buschinger 1989, Heinze 1989). In many species, queens have been found to have a worker-like morphology (intermorphic), where they show intermediate characteristics between gynomorphic and ergatomorphic (workers). Intermorphic individuals have reduced or absent wings and simplified thoracic structures (Heinze and Buschinger 1989, Heinze 1989). This condition of polymorphism has been associated with primitive subfamilies such as Ponerinae or Cerapachyinae (Heinze and Buschinger 1989), and also for more derived ants, such as *Monomorium* spp., *Aphaenogaster phalangium* Emery, 1890 (Murakami et al. 2002), and *Myrmecinae nipponica* Wheeler, 1906 (Miyazaki et al. 2005). *Eurhopalotrhix bruchi* belongs to the subfamily Myrmicinae, tribe Attini (Ward et al. 2014), which is considered evolutionarily modern (Ward 2014). However, in some species such as *M. nipponica*, both forms can coexist within the same colony (Murakami et al. 2002).

This scenario implies that this phenomenon has developed independently in 2 different clades, Ponerinae-Cerapachyinae and Myrmicinae, which strongly suggests that the selective factors that led to it are of a predominantly climatic nature and involving an increasing gradient of aridity (Heinze 1989, Tinaut and Heinze 1992). For this reason, the interomorphics are considered to be an adaptation to low food resources and/or an uneven distribution of nest sites (Miyazaki et al. 2005). In this way *Eurhopalotrhix bruchi* is similar to the South-Paleoarctic, Afrotropical, and Indomalayan species of *Monomorium* belonging to the *salomonis* group of (Bolton 1986, Heinze and Buschinger 1988).

Authors' Contributions

JMA collected the specimen, made the maps and wrote the text. ACC edited the photographs and measuremed the queens.

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